Guiding Pipeline Strategy Using Landscape Analysis with BizInt Smart Charts and VantagePoint

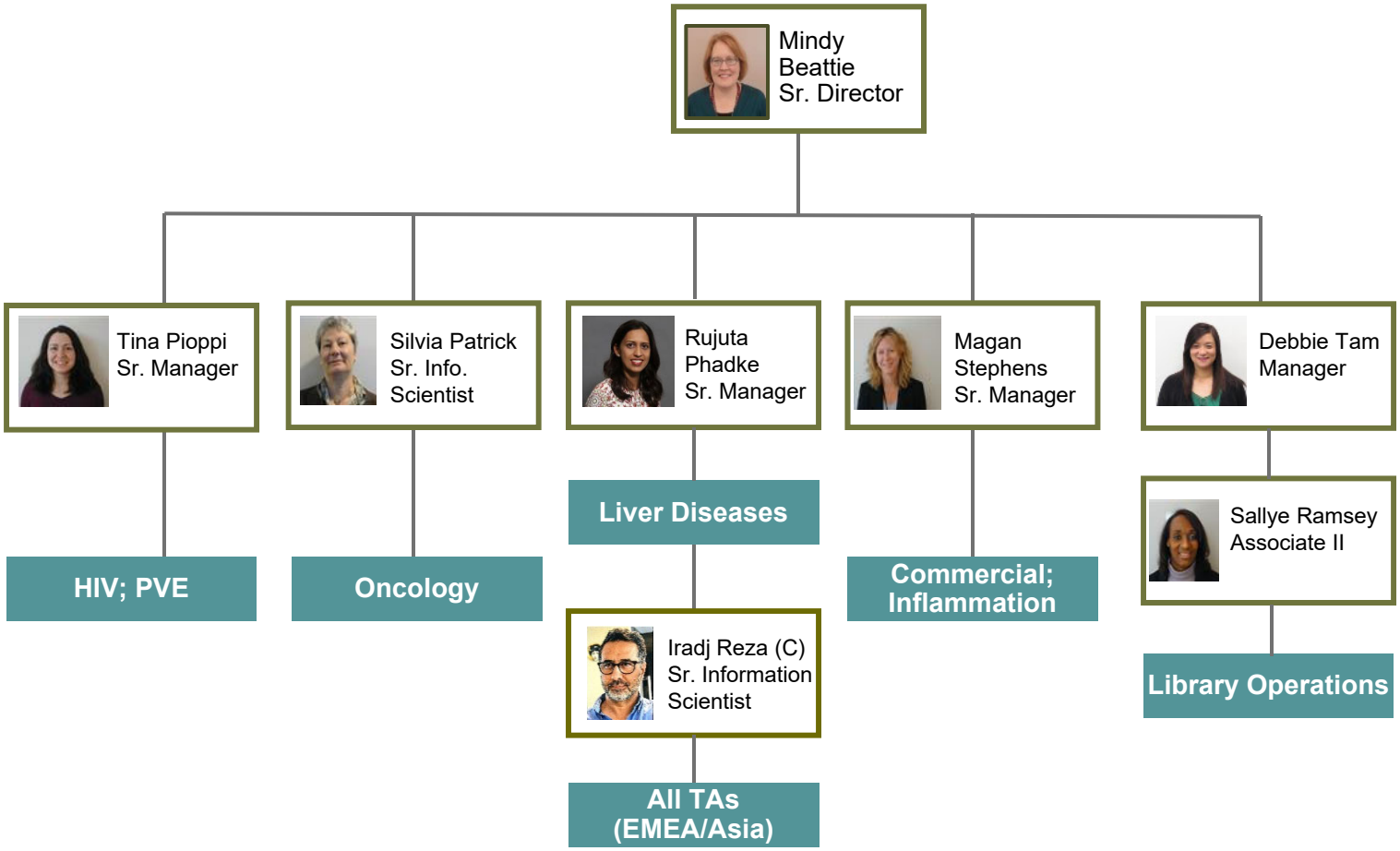
Rujuta Phadke
Library & Information Services, Gilead Sciences

Analytics and Visualization Meeting, 2019

Information

Library & Information Services (L&IS)

Mission: To work in partnership with all Gilead functions in providing strategic information resources, analysis, and consulting for improved decision-making.



L&IS Core Offerings

Literature Search

Run complex literature searches for internal customer groups
Provide information on pipeline, epidemiology, clinical trial, drug safety data etc.

Databases

Negotiate and manage a content portfolio of over 40 databases

Alerts

Set up automated literature alerts to monitor relevant topics

Journals

Maintain a collection of >7000 electronic journals

Training

Conduct training on platforms/databases

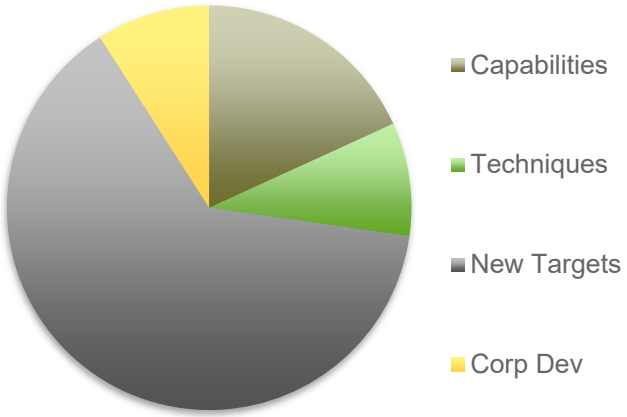
Agenda

- Working Groups
- Role of Research and Information Scientists
- Application of BizInt Smart Charts
- Evolution of Research Portfolio

Data in this presentation has been masked or modified to serve as an arbitrary example and does not indicate Gilead pipeline products

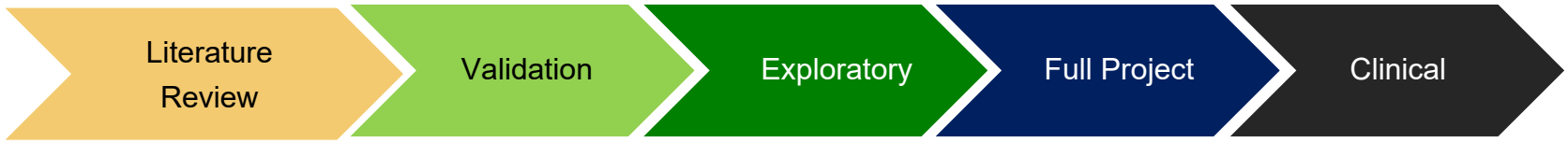
Research Working Groups

- Goal: Identify new targets to develop product pipeline through internal development and external partnerships
- Cross functional team of scientists and thought leaders from departments such as research, clinical, commercial, patent, information science and more that focus on a particular indication/target



Approximate % time devoted to four key areas

Target novelty requires early validation efforts



- Identify topic of interest
- *Literature review and competitive landscape analysis*
- *Supported by L&IS*

- Working Group Discussion
- Validation gaps identified and critical path activities determined
- Labwork initiated to enable go/no-go for project proposal

- Project proposal complete, Exploratory project granted
- *L&IS support for monitoring literature and competition*

- Exploratory work complete, Recommendation for development

Criteria used to prioritize targets

- Strong target hypothesis based on comprehensive review of literature
- Optimal market positioning based on competitive landscape
- Evidence of causality in experimental models
- Rationale for a therapeutic index
- Target tractability and existing chemical matter
- Strategic “fit”

Initial Working Group Research

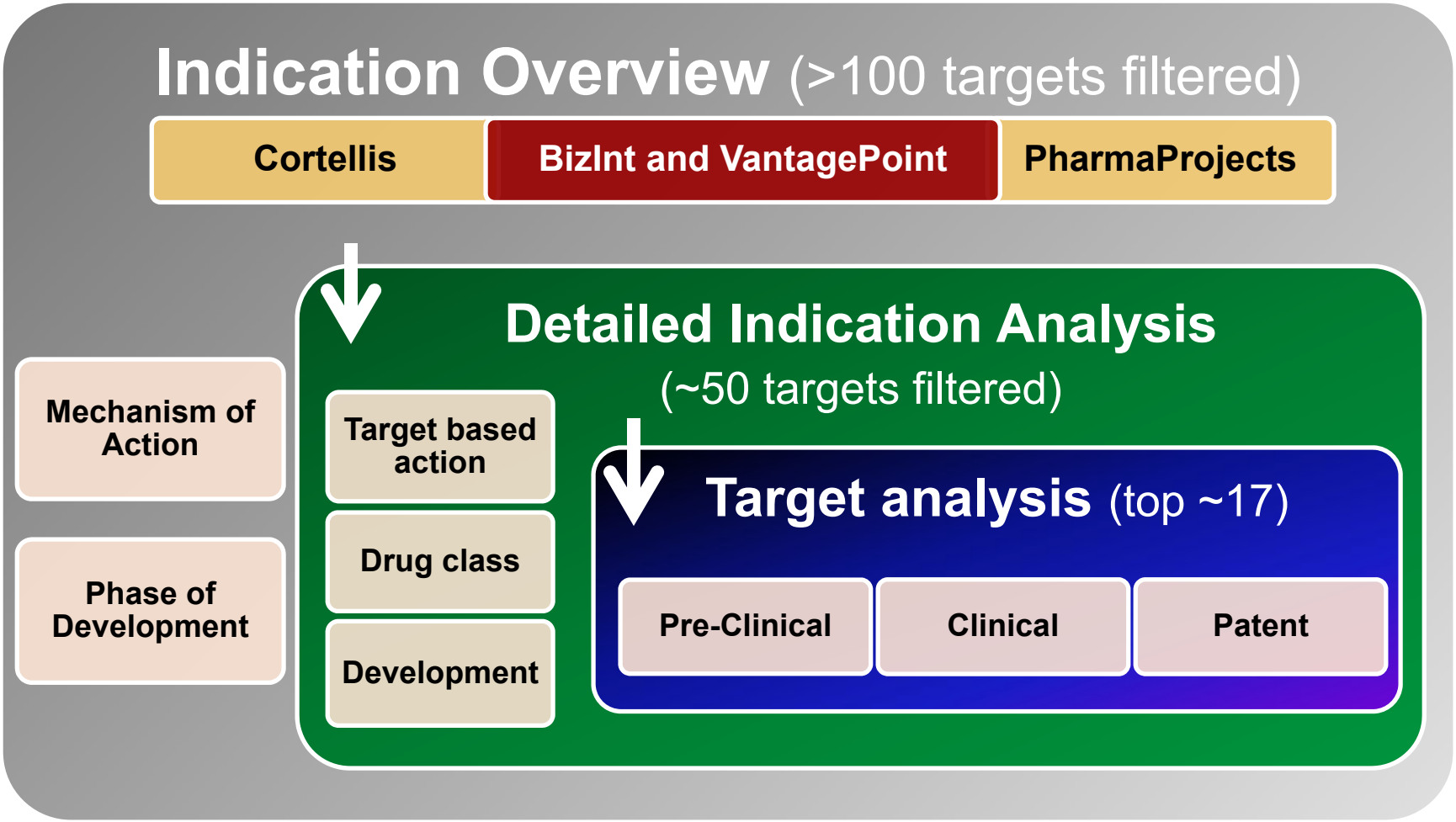
Individual scientists research targets in a piecemeal fashion from multiple sources

< 40 late phase targets identified that may/may not be strategic fits

Search Tool	Drawbacks
Google	Low relevance and consistency
Web	Limited sources & references, data gaps, unknown validity
Conference	Subject to attendance and knowledge sharing
Literature	Publication delay

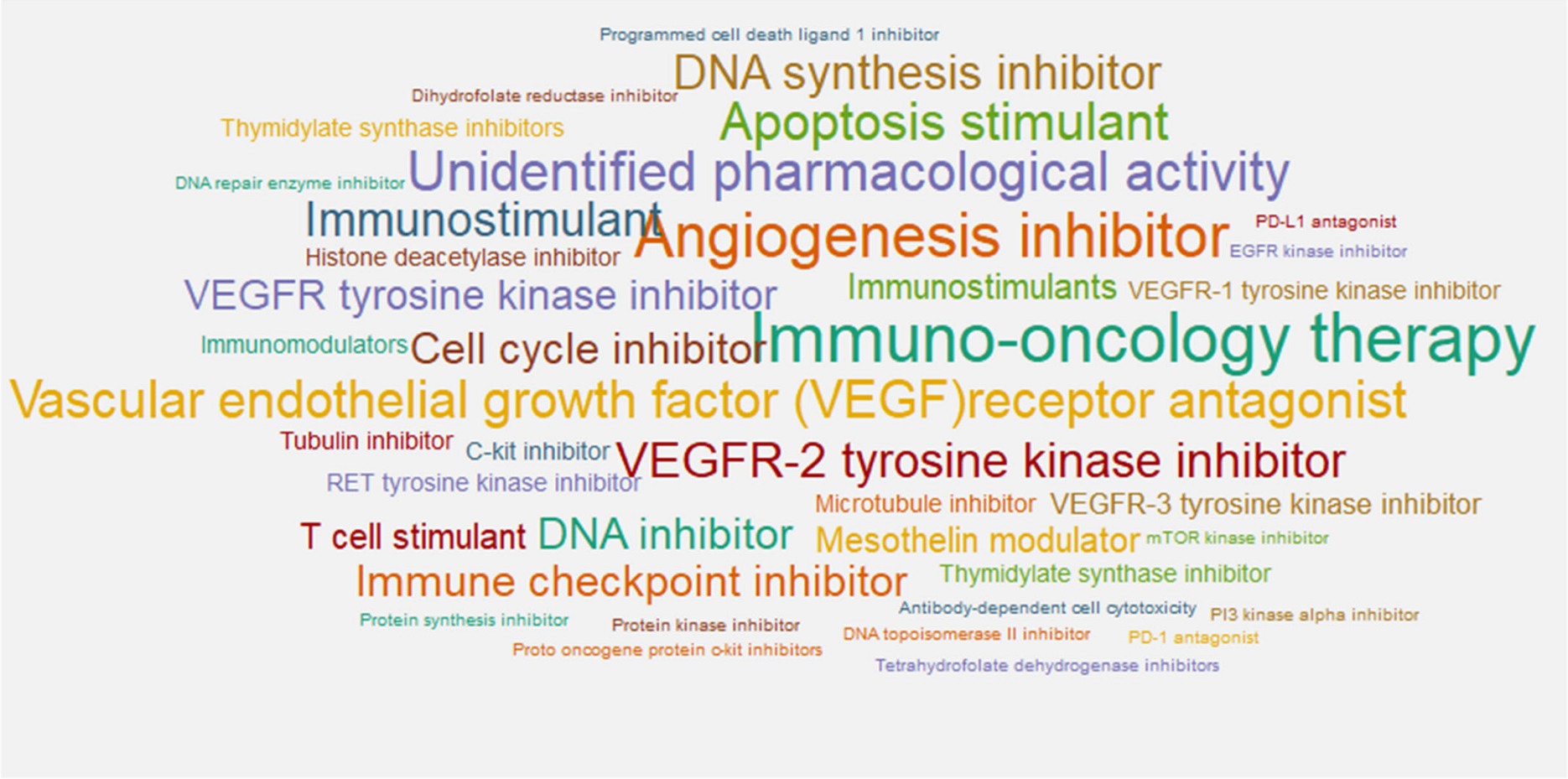
L&IS assisted with streamlined and focused competitive landscape database search and analysis using dedicated tools and efficient methods

Role of Information Scientist

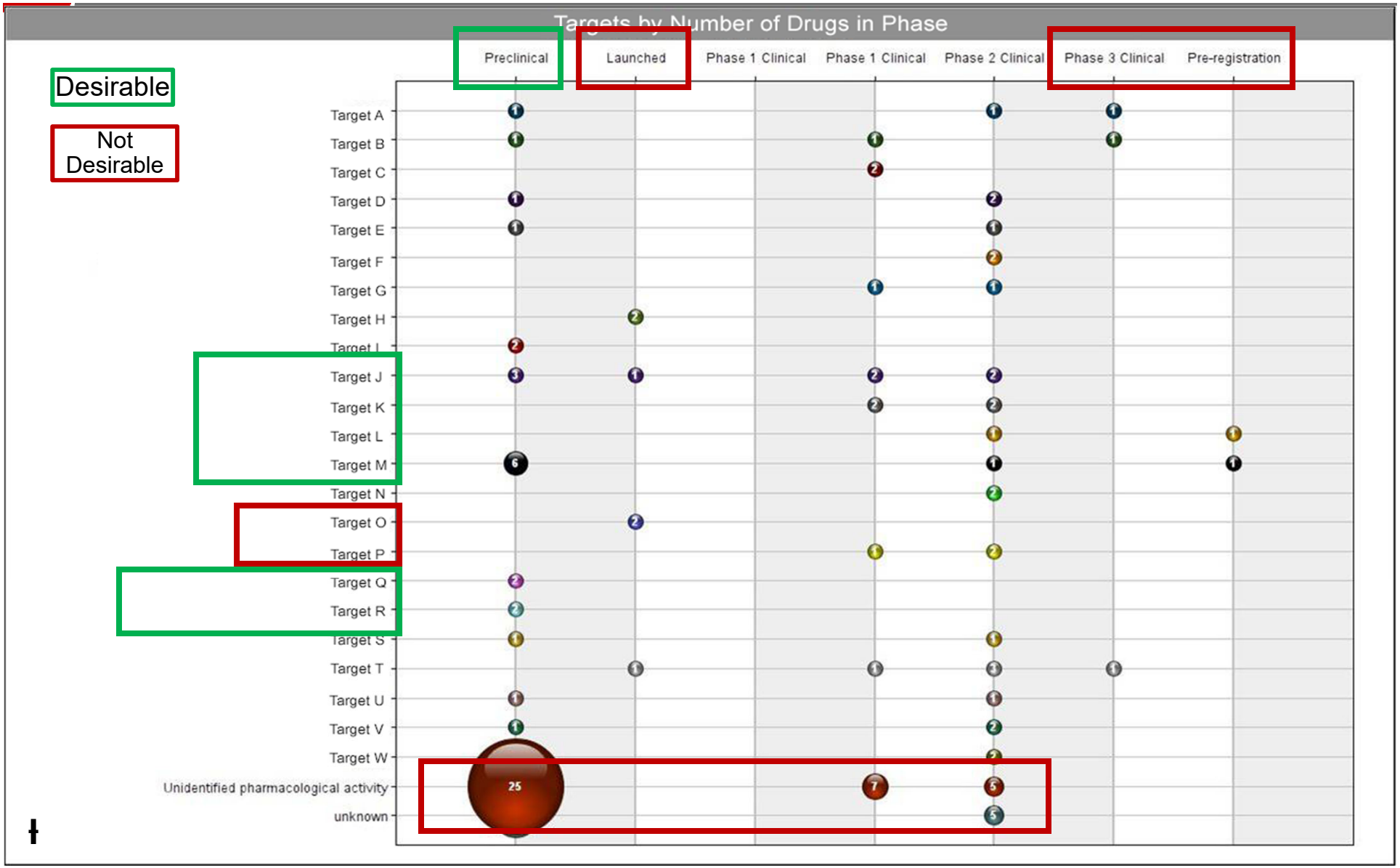


Target Novelty Sneak Peak

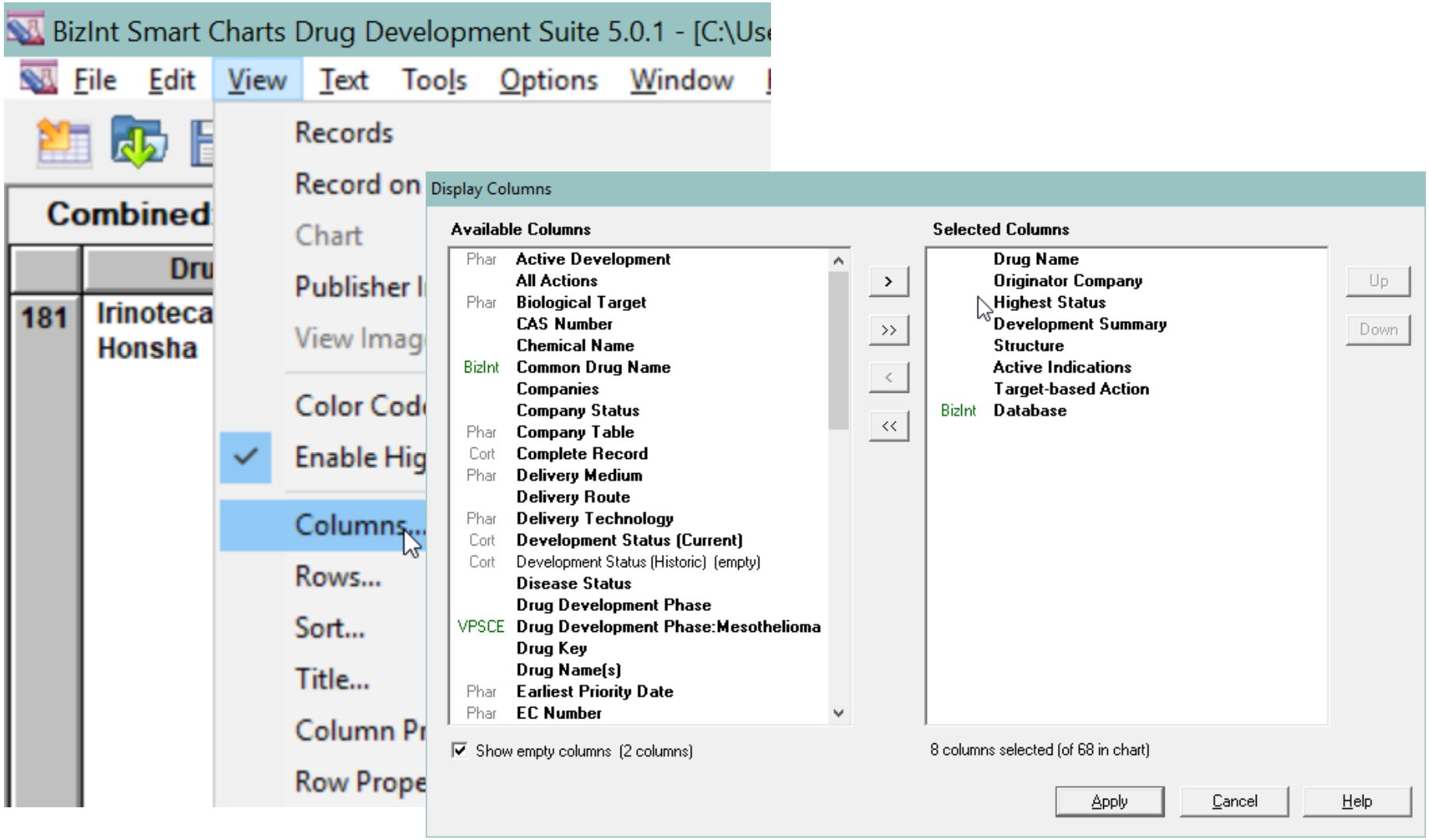
Target-based Action



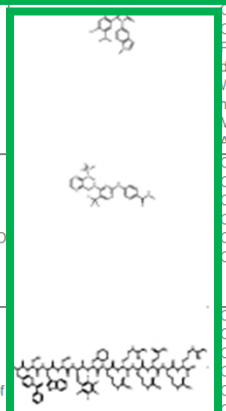
Review of Indication by MOA/Phase



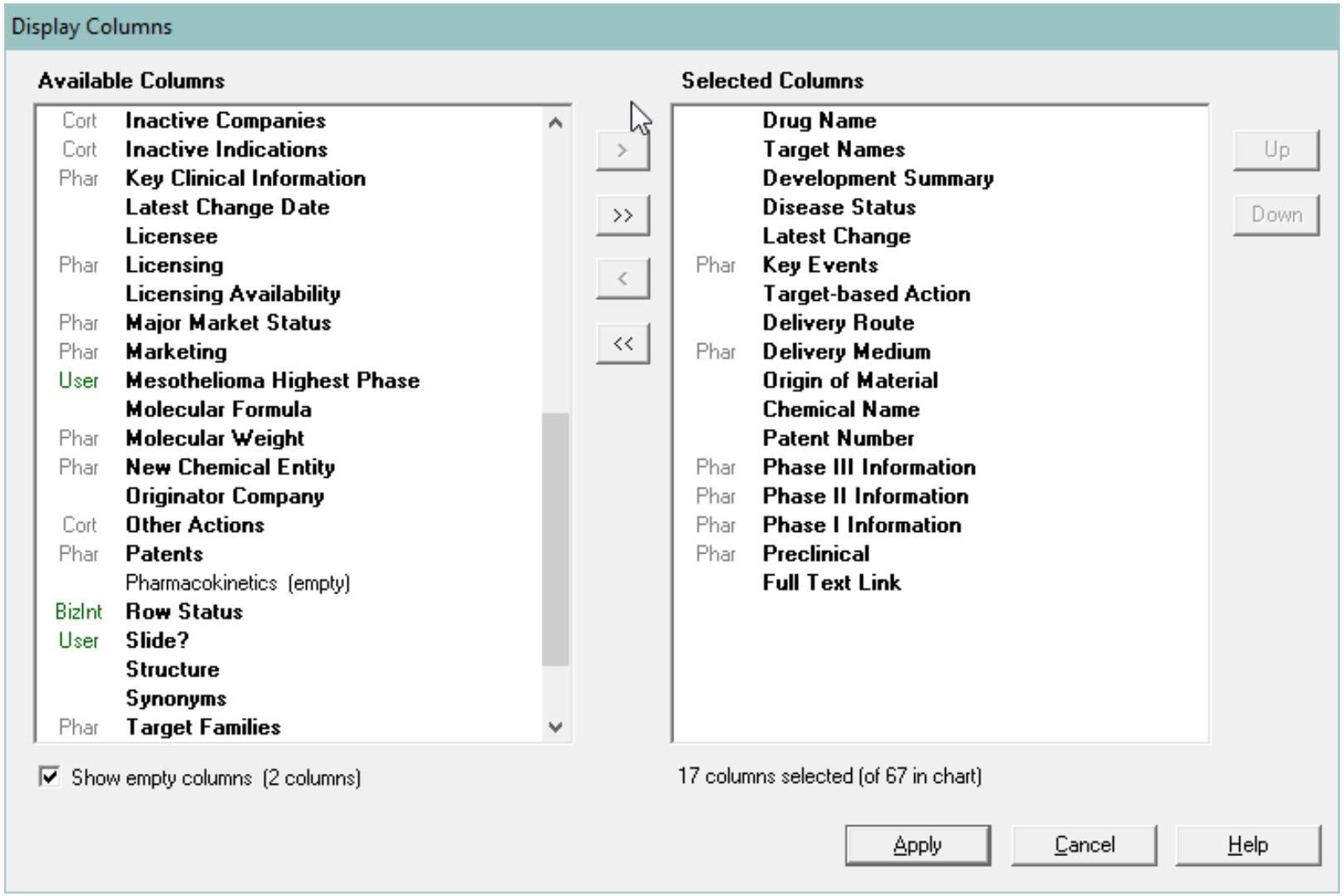
Column Selections



BizInt Smart Charts Indication search

	Drug Name	Originator Company	Highest Status	Development Summary	Structure	Active Indications	Target-based Action	Citeline Pharmaprojects	Cortellis from Clarivate Analytics
1	ganetespib	Synta Pharmaceuticals	Phase II Clinical Trial	Ganetespib (formerly STA-9090) a lead in a 2nd generation series of novel, injectable, synthetic, non-geldanamycin-related, small molecule hsp90 inhibitors, is under development by Aldeyra Therapeutics for the treatment of lymphoproliferative diseases, ovarian cancer and mesothelioma. It was previously under development by Synta Pharmaceuticals (now Madrigal Pharmaceuticals) (Company pipeline, Synta, Oct 2006; Form 10-K, Synta, 2006). They have potential as a combination therapy		Cancer, ovarian Cancer, mesothelioma Post transplant lymphoproliferative disorder Waldenstrom's hypergammaglobulinaemia Myelodysplastic syndrome Autoimmune lymphoproliferative	Heat shock protein 90 antagonist	1.1 Pipeln 34754	1.2 CORTL 54694
2	defactinib	Pfizer	Phase II Clinical Trial	Defactinib is a focal adhesion kinase (FAK) inhibitor, under development by Verastem Oncology for the treatment of cancer. It is also being investigated for the treatment of mesothelioma cancer (Company presentation, Verastem, 11 Jul 2013, http://phx.corporate-ir.net/External.File?t=1&item=VHIwZT0yfFBhcmVudElEPTQ5ODU5ND d8Q2hpbGRJRD01MTExNzY=). Previously Pfizer has discontinued development (ClinicalTrials.gov Web Page, 11 Nov 2008, NCT00787033; Company pipeline, Pfizer, 28 Feb 2012, Page 12,		Cancer, ovarian Cancer, mesothelioma Cancer, lung, non-small cell Cancer, pancreatic Cancer, solid, unspecified Cancer, myeloma	Focal adhesion kinase inhibitor	2.1 Pipeln 42414	2.2 CORTL 54518
3	CBP-501	CanBas	Phase II Clinical Trial	CBP-501 is a synthetic peptide calmodulin inhibitor abrogating the G2 checkpoint, under development by CanBas, for the treatment of cancer (Company Web Page, CanBas, 9 Dec 2003; Company pipeline, CanBas, 10 Dec 2015 & 15 Mar 2017, http://www.canbas.co.jp/pipeline/cbp501.html). It inhibits the activity of multiple kinases involved in G2 arrest and suppresses the phosphorylation of Cdc25C.		Cancer, mesothelioma Cancer, lung, non-small cell Cancer, solid, unspecified Cancer, bladder Cancer, ovarian Cancer, neuroendocrine, unspecified Cancer, oral	Calmodulin antagonist G2 checkpoint inhibitor	3.1 Pipeln 30798	3.2 CORTL 45852
4	carfilzomib	Onyx Pharmaceuticals	Launched	Carfilzomib (PR-171) is a synthetic analogue of epoxomicin, a proteasome inhibitor targeting a chymotrypsin-like protease, developed by Onyx Pharmaceuticals (now Amgen) using its propietary Captisol technology (Proteolix before the acquisition) for the treatment of cancer. It can act on haematological tumour cells and multiple myeloma (MM) cells, including those resistant to approved therapies (Company Web Page, Proteolix, 6 Sep 2006; Company pipeline, Amgen, 14 May 2014,		Cancer, myeloma Cancer, ovarian Cancer, renal Cancer, solid, unspecified Cancer, lung, small cell Cancer, lung, non-small cell Cancer, mesothelioma Cancer, lymphoma, non-Hodgkin's	Protease/peptidase inhibitor Apoptosis stimulant Proteasome inhibitor	4.1 Pipeln 35985	
5	BNC-105	Bionomics	Phase II Clinical Trial	BNC-105 is an orally-available analogue of combretastatin A4, under development by Bionomics as a vascular disrupting agent (VDA) for the treatment of cancer (Company Web Page, Bionomics, 4 Nov 2005; Scrip Daily Online, 29 Jun 2006, S00925464; Company Presentation, Bionomics, Mar 2015, Page 9, http://www.bionomics.com.au/%2Fupload%2Finvestors%2Fasx-announcements%2F4736%2FBionomics%202015%20Corporate%20Presentation%20February%202015.pdf; Company Fact Sheet,		Cancer, renal Cancer, mesothelioma Cancer, ovarian Cancer, lung, unspecified Cancer, thyroid Cancer, melanoma Cancer, leukaemia, chronic lymphocytic Cancer, leukaemia, acute myelogenous	Tubulin inhibitor Angiogenesis inhibitor	5.1 Pipeln 34636	5.2 CORTL 74303 5.3 CORTL 54639
6	atezolizumab	Roche	Launched	Genentech (Hoffmann-La Roche) has developed atezolizumab, an anti-PDL1 human MAb for the treatment of cancer (Company presentation, Roche, 31 Jan 2012, http://www.roche.com/irp120201-annex.pdf; ClinicalTrials.gov, 20 Jun 2011 & 12 Jul 2012, http://www.clinicaltrials.gov/show/NCT0137584; Company pipeline, Genentech, 13 Jul 2012, http://www.gene.com/gene/gred/science/pipeline/ & Roche, 21 Jul 2011 & 28 Jan 2015,		Cancer, bladder Cancer, lung, non-small cell Cancer, breast Cancer, lung, small cell Cancer, renal Cancer, urethral Cancer, colorectal Cancer, prostate	PD-L1 antagonist Immune checkpoint inhibitor Immuno-oncology therapy	6.1 Pipeln 71628	
7	amatuximab	Eisai	Phase II Clinical Trial	Amatuximab (MORAb-009) is a chimaeric IgG1 MAb targeting mesothelin, under development by Morphotek (Eisai) for the treatment of cancer (Press releases, Morphotek, 12 Jan 2004 & Eisai, 22 Mar 2007; Company pipeline, Eisai, 1 Nov 2013 & 30 Oct 2014, http://www.eisai.com/pdf/eir/erepo/epipeline.pdf). Mesothelin is overexpressed in colon, lung, mesothelioma, ovarian and pancreatic cancers (R&D Update, Eisai, 17 Jul 2007). Development for pancreatic cancer has been put on hold, pending review of the future		Cancer, mesothelioma Cancer, ovarian Cancer, lung, non-small cell Cancer, solid, unspecified Cancer, breast Cancer, colorectal Cancer, pancreatic	Mesothelin inhibitor Immunostimulant	7.1 Pipeln 32590	7.2 CORTL 52982

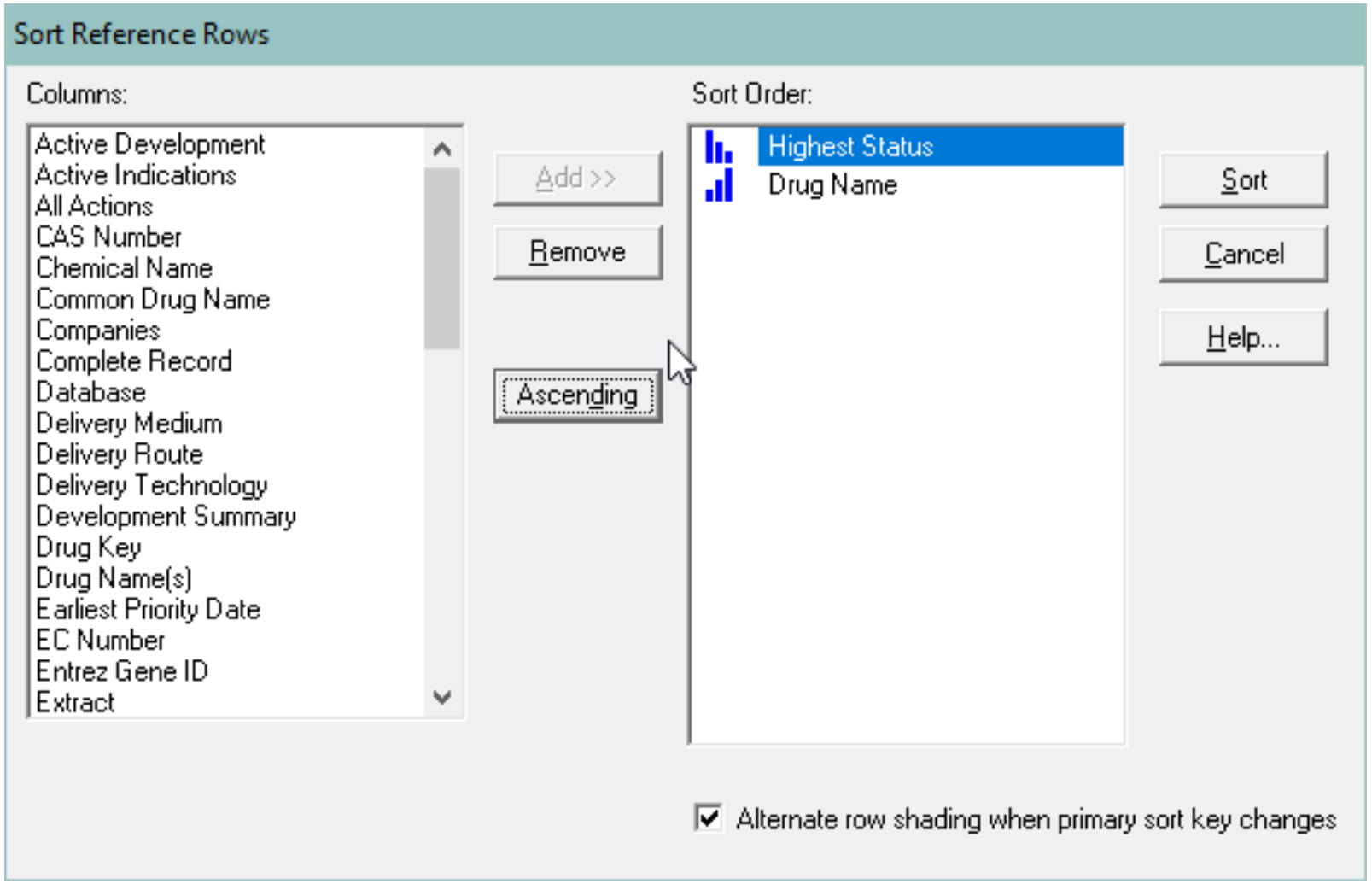
Column Selections



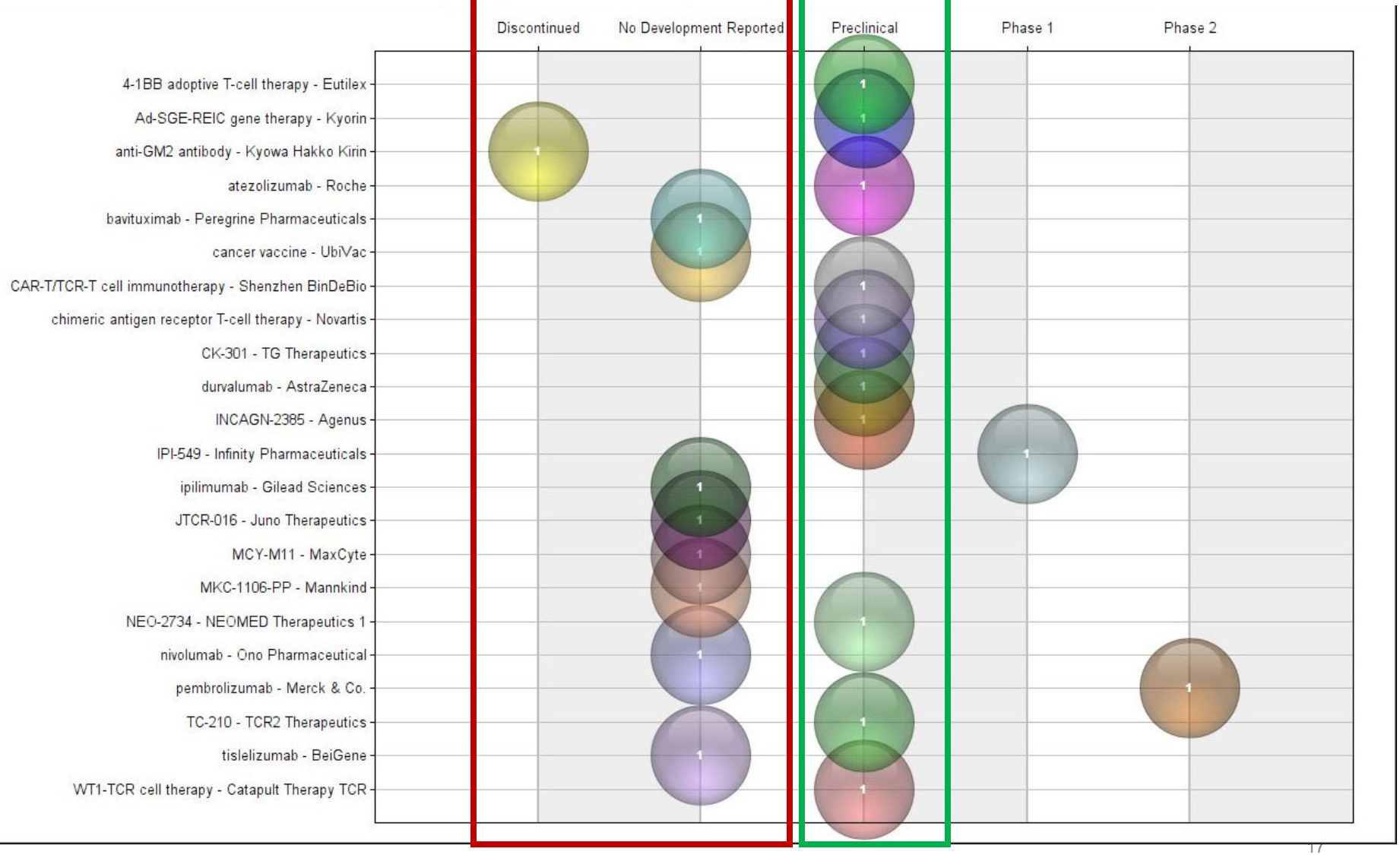
Exploration of a Selected Targets

Drug Name	**atezolizumab**	**napabucasin**	**JTCR-016**	**amatuximab**
Target Names	CD274 molecule	signal transducer and activator of transcription 3 (acute-phase response factor)	Wilms tumour 1	mesothelin
Development Summary	Genentech (Hoffmann-La Roche) has developed atezolizumab, an anti-PDL1 human MAb for the treatment of cancer	Napabucasin is an orally-administered agent targeting STAT3, under development by Boston Biomedical for	JTCR-016 is a high-affinity TCR T-cell product targeting Wilm's tumour 1 (WT1) protein, under development by Juno	Amatuximab (MORAb-009) is a chimaeric IgG1 MAb targeting mesothelin, under development by
Disease Status	Phase 2	Phase 2	Phase 2	Phase 2
Latest Change	Acceptance of US sBLA for non-small cell lung cancer reported	Completion of Phase I/II trial (D8807005) for mesothelioma reported	Ongoing development confirmed	Termination of Phase II trial (ARTEMIS; MORAb-009-201) for mesothelioma reported
Key Events (Date : Event : Detail)	2019-01-16 : Supplemental Filing : The US; Cancer, lung, non-small cell; in combination with Abraxane and	2018-12-10 : Chemical Structure Reported : New 2017-02-07 : Disease Phase Change :	2018-08-08 : Disease Phase Change : Cancer, breast, Cancer, ovarian, Cancer, pancreatic, Cancer, colorectal; NDR	2012-09-28 : Orphan Drug Status Granted : The US; Cancer, mesothelioma
Target-based Action	PD-L1 antagonist Immune checkpoint inhibitor Immuno-oncology therapy	STAT transcription factor 3 inhibitor Apoptosis stimulant	Immunostimulant Immuno-oncology therapy	Mesothelin inhibitor Immunostimulant
Delivery Route	Injectable Injectable, intravenous	Oral Oral, swallowed	Injectable	Injectable Injectable, intravenous
Delivery Medium	Solution	Capsule, hard		
Origin of Material	Biological, protein, antibody	Chemical, synthetic	Biological, cellular, autologous	Biological, protein, antibody
Chemical Name	Immunoglobulin G1, anti-(human cd antigen cd274) (human monoclonal MPDL3280A heavy chain), disulfide with	2-acetylbenzo[f][1]benzofuran-4,9-dione		Immunoglobulin G1, anti-(mesothelin) (human-mouse monoclonal MORAb-009 heavy chain), disulfide with human-
Patent Number				US6921666 US6737268
Phase III Information	Cancer, bladder An open-label, randomized, parallel-assignment, active-comparator Phase III trial (GO29294;	Cancer, colorectal It is in an open-label, randomized, prospective, parallel assignment Phase III trial		
Phase II Information	Cancer, bladder Genentech An adaptive Phase Ib/II trial(MORPHEUS) to evaluate the combination of Zejula and	Cancer, anal; Cancer, colorectal; Cancer, lymphoma, unspecified; Cancer, ovarian; Cancer, solid,	Cancer, leukaemia, acute myeloid; Cancer, leukemia, chronic myelogenous; Myelodysplastic	Cancer, breast; Cancer, colorectal; Cancer, lung, non-small cell Trials in nsclc, breast and colorectal cancers
Phase I Information	Cancer, bladder; Cancer, urethral A single-arm, open-label Phase I trial in 68 subjects previously treated with	Boston Biomedical An open-label, single-group assignment, Phase I trial (BBI608-104) in the US in 8 healthy adult		In Phase I trials, it was well tolerated (press release, Morohotek, 16 Apr 2008).
Preclinical	In vivo In mouse models, atezolizumab together with anti-PD-L1 reduced TGF-beta signaling in stromal cells,	In a preclinical study, it inhibited the Stat3, Nanog and ÃŸ-catenin pathways (Press release, DSP, 9 Oct 2013,		In preclinical studies, it inhibited tumour growth by inhibiting mesothelin binding to extracellular substrate and through
Full Text Link	Full-text link	Full-text link	Full-text link	Full-text link

Sort by Phase and Drug Name



Individual Target Analysis



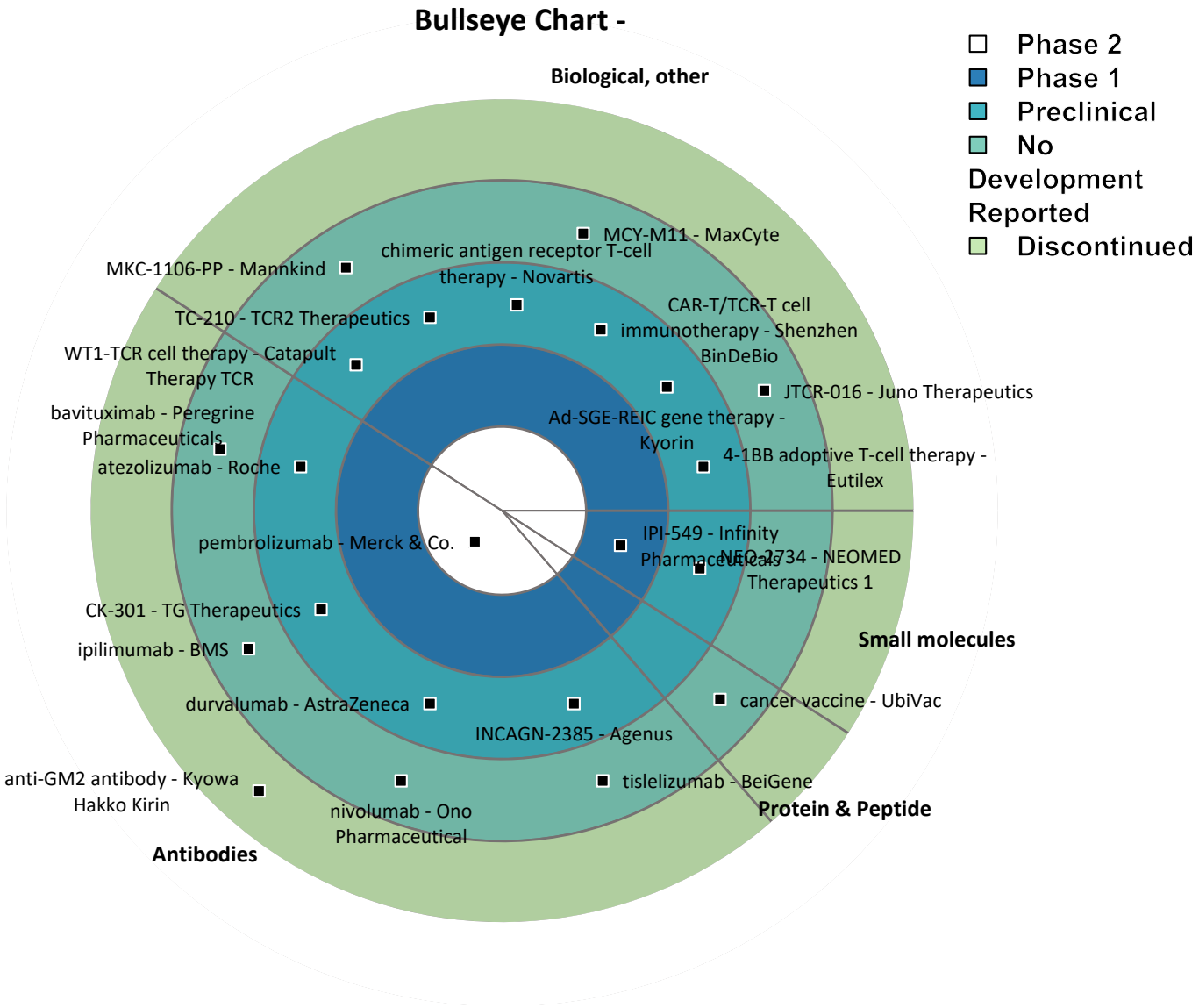
Individual Target Analysis

Discontinued	No Development Reported	Preclinical	Phase I	Phase II
anti-GM2 antibody Kyowa Hakko Kirin	**bavituximab** Peregrine Pharmaceuticals	**atezolizumab** Roche	**IPI-549** Infinity Pharmaceuticals	**pembrolizumab** Merck & Co.
	ipilimumab BMS	**CK-301** TG Therapeutics		
	nivolumab Ono Pharmaceutical	**durvalumab** AstraZeneca		
	tislelizumab BeiGene	**INCAGN-2385** Agenus		
	JTCR-016 Juno Therapeutics	**4-1BB adoptive T-cell therapy** Eutilex		
	MCY-M11 MaxCyte	**Ad-SGE-REIC gene therapy** Kyorin		
	MKC-1106-PP Mannkind	**CAR-T/TCR-T cell immunotherapy** Shenzhen BinDeBio		
	cancer vaccine UbiVac	**chimeric antigen receptor T-cell therapy** Novartis		
		TC-210 TCR2 Therapeutics		
		WT1-TCR cell therapy Catapult Therapy TCR		
		NEO-2734 NEOMED Therapeutics 1		

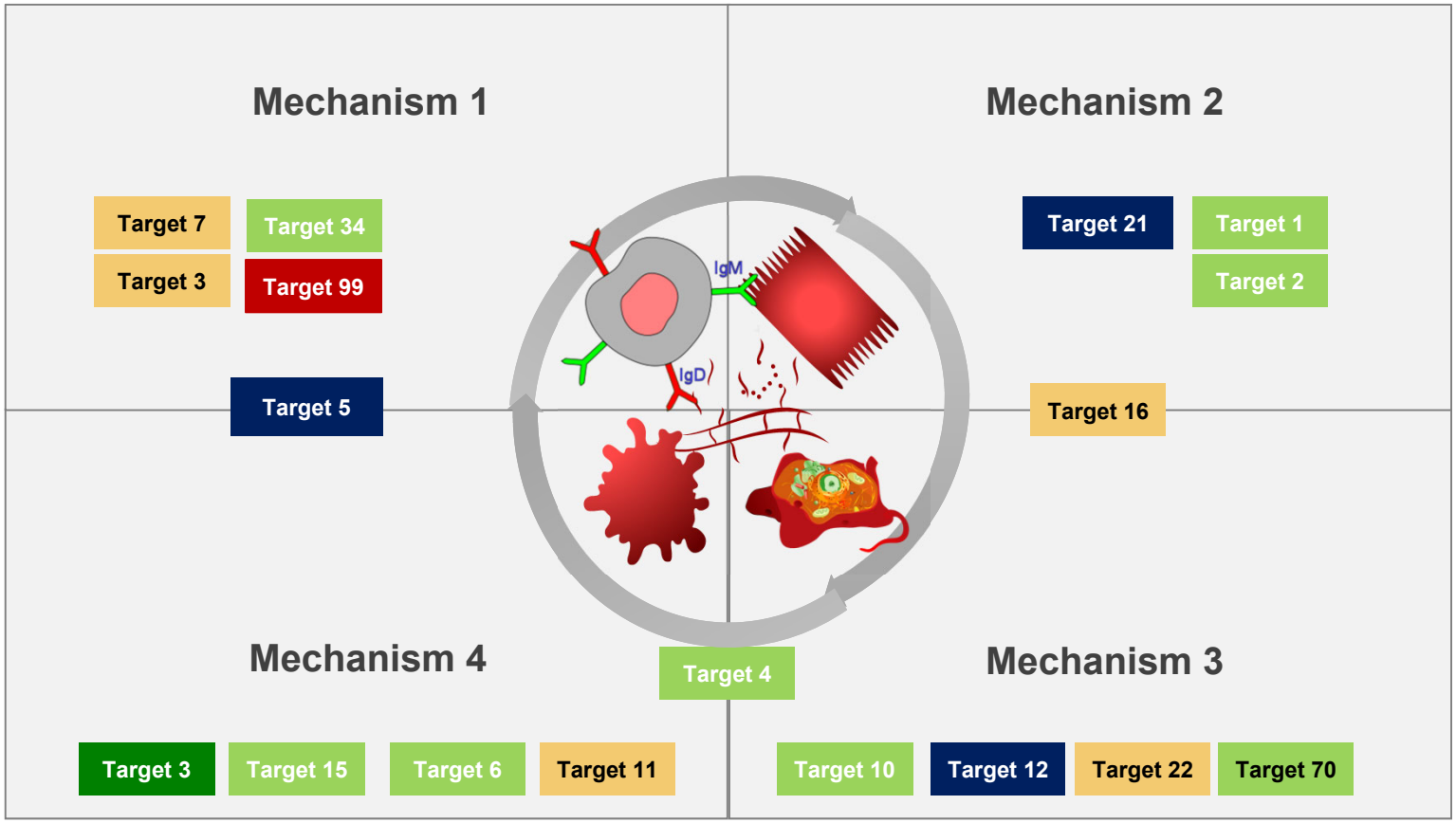
Origin of Material

- Antibodies
- Biological, other
- Protein & Peptide
- Small molecules

Individual Target Analysis

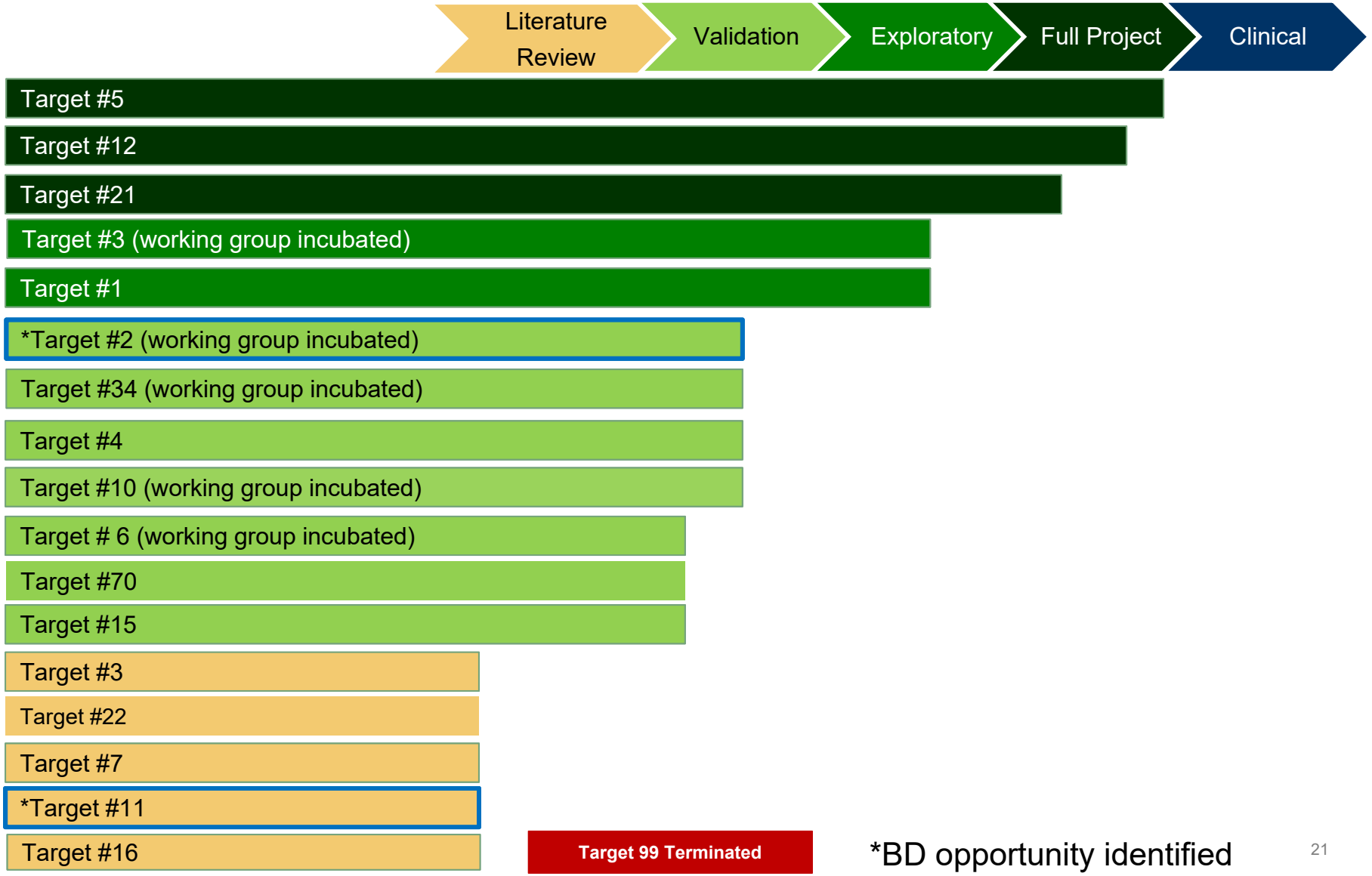


Pipeline Strategy: Target Multiple Mechanisms



Literature review | Validation | Exploratory | Full Project | Clinical

Evolved Research Portfolio



*BD opportunity identified

Summary

- Information science can assist research efforts towards product lifecycle planning and portfolio management
- BizInt Smart Charts Drug Development Suite and VantagePoint - Smart Charts Edition are powerful tools for the compilation, filtering, analysis and display of relevant information from individual databases
- Complex data sets can be presented in user friendly formats including integrated reports and compelling visuals
- Data drives decisions: It is important to maintain a balance between presentation of granular data and high level summary visuals

Acknowledgements

- Working Group scientists
- The BizInt Team
- The Gilead L&IS team
- IC-SDV & AVM organizers

Z kr#kdv#wkh#luw#cxhvwlrqB